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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/748,198	12/27/2000	Shinichi Kanna	Q62447	5369

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EXAMINER	
LEE, SIN J	
ART UNIT	**PAPER NUMBER**
1752	7

DATE MAILED: 09/17/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/748,198	Applicant(s) KANNA ET AL	
	Examiner Sin J Lee	Art Unit 1752	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 June 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☒ Claim(s) *21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Based on applicants' statement that the present invention and Kodama et al (6,265,135 B1) were commonly owned at the time of the making of present invention, the previously made rejections on claims 1-20 over Kodama et al'135 in view of Kobayashi et al'500 are hereby withdrawn.

2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

3. Claims 1, 3, 4, 8-10, and 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasa et al (5,994,025) in view of Kobayashi et al (6,136,500).

In Embodiment 20 (see Table 2, and col.24, lines 55-67), Iwasa uses a resist composition having Polymer of Embodiment 7 (which structure is shown in col.20, lines 10-20) and N-hydroxysuccinimidetoluene*sulfonate* (*present photoacid generator (b-1)* that generates a sulfonic acid upon exposure to radiation), dissolved in propyleneglycolmonomethylether acetate (a *solvent*). The polymer of Embodiment 7 teaches present resin of the formula (I); in present formula, R_1 would be an alkyl group having 1 carbon atom, n would be an integer of 2, and W would be an organic group containing 2 oxygen atoms and 2 carbon atoms, more specifically -O-C(=O)-CH_3 (presently claimed -O-C(=O)-R_2 of claim 3 wherein R_2 represents an alkyl group having 1 carbon atom). Iwasa also teaches (col.10, lines 27-33) that his photoresist composition may include a *surfactant*. Therefore, Iwasa teaches every component of present claim 1 except for the present component (b-2).

Kobayashi et al, a reference which teaches a positive type radiation sensitive resin composition, teaches (col.2, lines 42-59 and col.12, lines 50-65) that using a photoacid generator comprising (I) a compound that upon exposure to radiation generates a carboxylic acid and (ii) a compound that upon exposure to radiation generates an acid other than a carboxylic acid can markedly suppress the problems of "nano-edge roughness" or "coating surface roughness". As particularly preferred acid generators that generates a carboxylic acid, Kobayashi includes *iodonium salts of carboxylic acids* and *sulfonium salts of carboxylic acids* (see col.15, lines 66-67, col.16, lines 1-7). Kobayashi also teaches (col.17, lines 63-65) that for the acid generators

that generates an acid other than a carboxylic acid, compounds that upon exposure to radiation generates *sulfonic acid* and/or sulfinic acid are preferred. Since Iwasa's photoacid generator used in Embodiment 20 also generates a sulfonic acid upon exposure to radiation, it is the Examiner's position that based on Kobayashi's teaching it would have been obvious to one of ordinary skill in the art to use iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids together with Iwasa's photoacid generator in Iwasa's invention in order to markedly suppress the problems of "nano-edge roughness" or "coating surface roughness" as taught by Kobayashi. *Furthermore*, in Kobayashi's Tables 1 and 5, the direct comparison between the *Example 1* (wherein B1 (the carboxylic acid-generating compound) and B2 (the sulfonic acid-generating compound) are used together) and the *Comparative Example 1* (wherein B1 is not used) and the direct comparison between the *Example 5* (wherein B1 and B2 are used together) and the *Comparative Example 2* (wherein B1 is not used) show that when one uses both of those acid generating compounds together, not only it suppresses problems of coating surface roughness, but also it *improves resolution* (see Table 5).

Because the iodonium salts of carboxylic acids or the sulfonium salts of carboxylic acids are also cited (see pg.67, last paragraph of present specification) by applicants as examples for the photoacid generator (b-2), Iwasa in view of Kobayashi would render obvious present component (b-2), and either of iodonium salts of carboxylic acids and sulfonium salts of carboxylic acids would *inherently* make no contribution to the decomposition reaction of the

acid-decomposable group as presently recited. Therefore, Iwasa in view of Kobayashi teaches present inventions of claims 1, 3, and 4.

With respect to present claims 8-10, Iwasa uses 0.99 grams of the polymer in Embodiment 20, which converts to 99 wt% of the polymer, and thus the prior art teaches present inventions of claims 8-10.

With respect to present claims 18-20, Kobayashi teaches (col.20, lines 40-44) that the weight ratio of the acid generator that generates a carboxylic acid to the acid generator that generates an acid other than a carboxylic acid is usually 0.01 to 5. Therefore, it would have been obvious to one of ordinary skill in the art to use iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids together with Iwasa's photoacid generator in Iwasa's invention in the weight ratio of 0.01-5 in order to markedly suppress the problems of "nano-edge roughness" or "coating surface roughness" as taught by Kobayashi. The prior art's range of 0.01 to 5 teaches present range of claim 18. This range also overlaps with present ranges of claims 19 and 20, and thus the prior art's range would have made the present ranges of claims 19 and 20 prima facie obvious. In re Wertheim, supra.

With respect to present claims 12-17, since Iwasa uses 0.01 grams of the photoacid generator (i.e., the sulfonic acid generator) and since Kobayashi teaches (col.20, lines 40-44) that the weight ratio of the acid generator that generates a carboxylic acid to the acid generator that generates an acid other than a carboxylic acid is usually 0.01 to 5, this will give 0.0001 - 0.05

grams for iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Assuming that one adds 0.0001 grams of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids to the resist composition of Embodiment 20, this will give 1 wt% of Iwasa's photoacid generator and 0.01 wt% of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Assuming that one adds 0.05 grams of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids, this will give 0.95 wt% of Iwasa's photoacid generator and 4.76 wt% of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Therefore, Iwasa's photoacid generator will range from 0.95-1 wt% and iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids will range from 0.01-4.76 wt%. The range of 0.95-1 wt% for Iwasa's photoacid generator overlaps with present ranges of claims 12-14, and the range of 0.01-4.76 wt% for iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids overlaps with present ranges of claims 15-17. Therefore, the prior art's teaching would render the present ranges of claims 12-17 prima facie obvious. In re Wertheim, supra.

4. Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasa et al (5,994,025) in view of Kobayashi et al (6,136,500) as applied to claim 1 above, and further in view of Tan et al (6,004,721).

Iwasa in view of Kobayashi with respect to present claim 1 is discussed in Paragraph 4 above. With respect to present claim 5, Iwasa in view of Kobayashi do not explicitly teach the presently claimed organic basic compound. Tan teaches (col.44, lines 44-48) that adding an

organic basic compound to a positive photoresist composition improves storage stability and reduces the line width change caused by PED (lapse of the time from exposure to baking). It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to add an organic basic compound into the photoresist composition taught by Iwasa in view of Kobayashi in order to improve storage stability and reduce the line width change caused by PED as taught by Tan et al. Therefore, Iwasa in view of Kobayashi and further in view of Tan et al would render obvious present invention of claim 5.

With respect to present claim 11, Iwasa in view of Kobayashi do not explicitly teach the presently claimed alkali-soluble resin without containing the acid-decomposing group. Tan teaches (col.19, lines 15-20) that an alkali-soluble resin not containing acid-decomposable groups can be added to a positive photoresist composition in order to improve sensitivity. It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to add an alkali soluble resin into the photoresist composition taught by Iwasa in view of Kobayashi in order to improve sensitivity as taught by Tan et al. Therefore, Iwasa in view of Kobayashi and further in view of Tan et al would render obvious present invention of claim 11.

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan et al (6,004,721) in view of Kobayashi et al (6,136,500).

The resin shown in col.8, lines 5-10 of Tan teaches present resin of the formula (I); in the present formula, R_1 would be an alkyl group having 1 carbon atom, n would be an integer of 2,

and W would be an organic group containing two oxygen atoms and two carbon atoms, more specifically, -O-C(=O)-CH_3 group (which is presently claimed -O-C(=O)-R_2 group wherein R_2 represents an alkyl group having 1 carbon atom). Tan teaches (col.7, lines 48-53) that their resin can be made by synthesizing a vinyl ether corresponding to the substituent and reacting the ether with the alkali-soluble resin containing phenolic hydroxyl groups. Therefore, in order to make the resin shown in col.8, lines 5-10, Tan first makes (in Synthesis Example I-1) a vinyl ether X-1 (which has the chemical structure of H_2C=CH-O-CH_2CH_2-O-C(=O)-CH_3), and then react the vinyl ether with poly(p-hydroxystyrene) ("alkali-soluble resin A-4" which is synthesized in synthesis Example II-4) to obtain the resin B-1 (see Synthesis Example III-1), which is the same resin shown in col.8, lines 5-10. Then, in Example 1 (see Table 2), Tan uses a photoresist composition containing the resin B-1 (*present component (a)*), a photoacid generator D-1 (*present photoacid generator (b-1)* that generates a sulfonic acid upon exposure to radiation), and an *organic basic compound*, all dissolved in propylene glycol monoethyl ether acetate (*a solvent*). Tan also teaches (col.46, lines 8-12) that his photoresist composition can further contain *surfactants*. Therefore, the prior art teaches every component of present claim 1 except for the present component (b-2).

Kobayashi et al, a reference which teaches a positive type radiation sensitive resin composition, teaches (col.2, lines 42-59 and col.12, lines 50-65) that using a photoacid generator comprising (I) a compound that upon exposure to radiation generates a carboxylic acid and (ii) a

compound that upon exposure to radiation generates an acid other than a carboxylic acid can markedly suppress the problems of "nano-edge roughness" or "coating surface roughness". As particularly preferred acid generators that generates a carboxylic acid, Kobayashi includes *iodonium salts of carboxylic acids* and *sulfonium salts of carboxylic acids* (see col.15, lines 66-67, col.16, lines 1-7). Kobayashi also teaches (col.17, lines 63-65) that for the acid generators that generates an acid other than a carboxylic acid, compounds that upon exposure to radiation generates *sulfonic acid* and/or sulfinic acid are preferred. Since Tan's photoacid generator (D-1) used in Example 1 also generates a sulfonic acid upon exposure to radiation, it is the Examiner's position that based on Kobayashi's teaching it would have been obvious to one of ordinary skill in the art to use iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids together with Tan's photoacid generator in Tan's invention in order to markedly suppress the problems of "nano-edge roughness" or "coating surface roughness" as taught by Kobayashi. *Furthermore*, in Kobayashi's Tables 1 and 5, the direct comparison between the *Example 1* (wherein B1 (the carboxylic acid-generating compound) and B2 (the sulfonic acid-generating compound) are used together) and the *Comparative Example 1* (wherein B1 is not used) and the direct comparison between the *Example 5* (wherein B1 and B2 are used together) and the *Comparative Example 2* (wherein B1 is not used) show that when one uses both of those acid generating compounds together, not only it suppresses problems of coating surface roughness, but also it *improves resolution* (see Table 5).

Because the iodonium salts of carboxylic acids or the sulfonium salts of carboxylic acids are also cited (see pg.67, last paragraph of present specification) by applicants as examples for the photoacid generator (b-2), Tan in view of Kobayashi would render obvious present component (b-2), and either of iodonium salts of carboxylic acids and sulfonium salts of carboxylic acids would *inherently* make no contribution to the decomposition reaction of the acid-decomposable group as presently recited. Therefore, Tan in view of Kobayashi teaches present inventions of claims 1-5.

With respect to present claims 6 and 7, Tan teaches (col.18, lines 53-56) that 10-80% of the phenolic hydroxyl groups of the alkali soluble resin (such as poly(p-hydroxystyrene)) is substituted with substituents. Since this range overlaps with present ranges of claims 6 and 7, the prior art's range would have made present ranges of these claims prima facie obvious. In re Wertheim, supra.

With respect to present claims 8-10, since Tan uses 1.60 grams of the resin B-1 in Example 1 (which converts to 95 wt%), the prior art in view of Kobayashi teaches present inventions of claims 8-10.

With respect to present claim 11, Tan teaches (col.19, lines 15-17) that an alkali-soluble resin can be added to his photoresist composition in order to improve sensitivity. Therefore, the prior art in view of Kobayashi teaches present invention of claim 11.

With respect to present claims 18-20, Kobayashi teaches (col.20, lines 40-44) that the weight ratio of the acid generator that generates a carboxylic acid to the acid generator that generates an acid other than a carboxylic acid is usually 0.01 to 5. Therefore, it would have been obvious to one of ordinary skill in the art to use iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids together with Tan's photoacid generator (D-1) in Tan's invention in the weight ratio of 0.01-5 in order to markedly suppress the problems of "nano-edge roughness" or "coating surface roughness" as taught by Kobayashi. The prior art's range of 0.01 to 5 teaches present range of claim 18. This range also overlaps with present ranges of claims 19 and 20, and thus the prior art's range would have made the present ranges of claims 19 and 20 prima facie obvious. In re Wertheim, supra.

With respect to present claims 12-17, since Tan uses 0.08 grams of the photoacid generator (D-1) in Example 1, and since Kobayashi teaches (col.20, lines 40-44) that the weight ratio of the acid generator that generates a carboxylic acid to the acid generator that generates an acid other than a carboxylic acid is usually 0.01 to 5, this will give 0.0008-0.4 grams for iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Assuming that one adds 0.0008 grams of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids to the resist composition of Tan's Example 1, this will give 4.7 wt% of the photoacid generator (D-1) and 0.047 wt% of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Assuming that one adds 0.4 grams of iodonium salts of carboxylic acids or sulfonium salts of

carboxylic acids, this will give 3.84 wt% of the photoacid generator (D-1) and 19.2 wt% of iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids. Therefore, the photoacid generator (D-1) will range from 3.84-4.7 wt% and iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids will range from 0.047-19.2 wt%. The range of 3.84-4.7 wt% for the photoacid generator (D-1) overlaps with present ranges of claims 12-14, and the range of 0.047-19.2 wt% for iodonium salts of carboxylic acids or sulfonium salts of carboxylic acids overlaps with present ranges of claims 15-17. Therefore, the prior art's teaching would render the present ranges of claims 12-17 *prima facie* obvious. In re Wertheim, supra.

6. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims since none of the cited prior arts teaches or suggests present R_4 group of claim 21.

7. Applicants argue that Kanna's Declaration shows unexpectedly superior results obtained by the present invention over the teachings of the cited arts. The declarative examples were carefully considered but found unpersuasive.

Applicants state that compared to Additional Example 1, in Additional Comparative Example 1, measurements were not obtained since the limiting resolution was 0.20 um and the image was not resolved to 0.17 um and 0.15 um (i.e., the Additional Comparative Example 1 could not provide a sufficient resolution to be evaluated in the invention). Also, applicants state

that compared to Additional Example 3, in Additional Comparative Example 3, measurements were not obtained, since the limiting resolution was 0.20 um and the image was not resolved to 0.17 um and 0.15 um. However, these results are not *unexpectedly* superior results, because as discussed above in Paragraphs 4-5, the comparison of Kobayashi's *Example 1* and *Comparative Example 1*, and the comparison of Kobayashi's *Example 5* and the *Comparative Example 2* show that when one uses both of those acid generating compounds together, not only it suppresses problems of coating surface roughness, but also it *improves resolution.* That is, one of ordinary skill in the art looking at Kobayashi's comparisons would already expect that resolution would improve when both of those acid generating compounds are used together.

With respect to Additional Example 2 and Additional Comparative Example 2, applicants state that Additional Comparative Example 2 containing the photoacid generators (b-1) and (b-2) for use in the invention and a resin having a structure different from that of Additional Example 2 could not exert a sufficient effect in pitch dependency and exposure latitude. Applicants state that the effect of the invention is exerted by the incorporation of the resin (a) having a specific structure and the specific photoacid generators (b-1) and (b-2). However, the Examiner's rejection was based on either of Iwasa's composition or Tan's composition, *which already contains the present resin (a) having the formula (I),* and the secondary reference, Kobayashi et al, was cited solely for the teaching of the present photoacid generator of (b-2). In order for the comparison to be effective so as to overcome the present rejections therefore, applicants need to

show that adding present photoacid generator of (b-2) (as taught by Kobayashi) to either of Iwasa's composition or Tan's composition would do something unexpected and superior.

For the reasons stated above, present rejections over the cited prior arts still stand.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is (703) 305-0504. The examiner can normally be reached on Monday-Friday from 8:30 am EST to 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ms. Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9311 for after final responses or (703) 872-9310 for before final responses.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0661.

S. J. L.

S. Lee
September 12, 2002

JANET BAXTER
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